

VIEWPOINT

Dynamite Fishing in Southern Tanzania, Geographical Variation, Intensity of Use and Possible Solutions

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The use of dynamite to kill marine fish has been reported in Tanzania since the 1960s (Ray, 1968; Bryceson, 1978, 1981). Today it is one of the most common methods used and because of its high intensity virtually all coral reefs along the coast of Tanzania are now being degraded at an unprecedented and alarming rate (UNEP, 1989; Darwall *et al.*, 1996). One of the main reasons attributed to its continual use is local poverty. However, in reality it is not the fishermen who make large amounts of money but the dealers and unknown boat owners who by providing dynamite at a relatively low cost are able to ensure its use is sustained. This problem is further underpinned by ineffective law enforcement, inadequate legislation, insufficient regulation of dynamite supplies and a prevailing opinion that corruption will prevent any effective action being taken. Nevertheless, what is required is immediate action otherwise in the near future many Tanzanian coastal communities will experience severe declines in reef biodiversity and fish stocks such that local incomes will dwindle still further and a major food source could be lost.

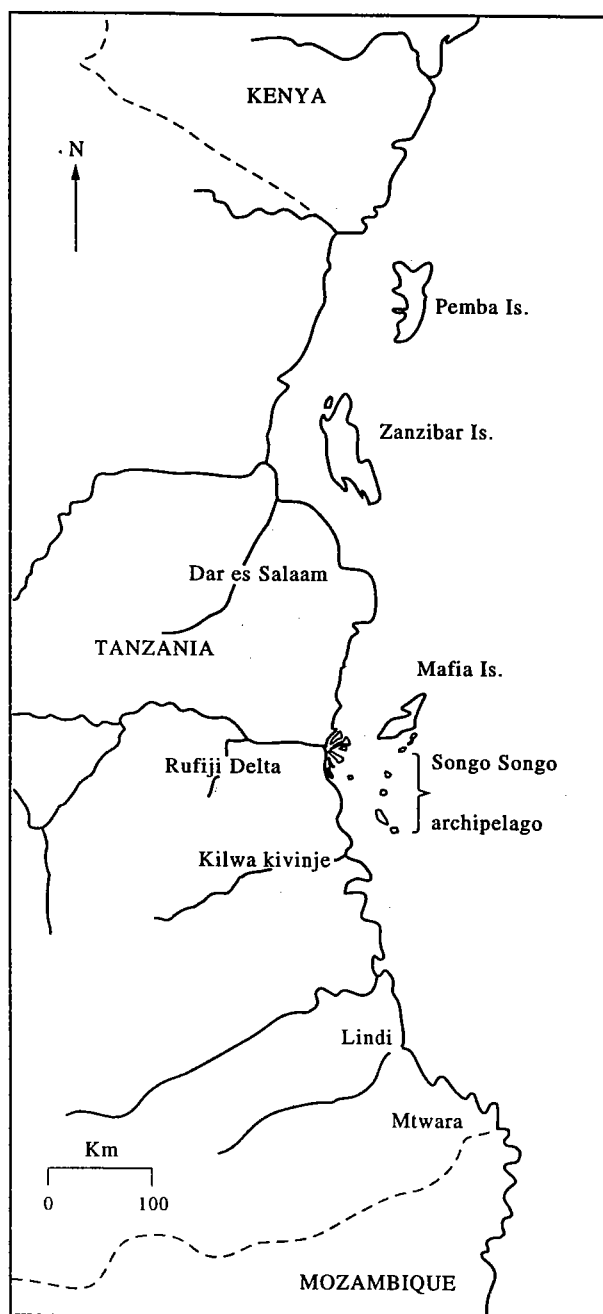
The Impact of a Dynamite Blast

What are the impacts of dynamite? Firstly, a typical dynamite blast kills all fish within a 50–70 m radius (Alcala and Gomez, 1987), by sending a powerful shock wave through the water causing the internal organs of a fish, such as swim bladders and intestines, to burst while the skeleton of the fish sustains hundreds of small fractures (Ronquillo, 1961). After the explosion a small proportion of the dead fish float to the surface to be collected by the fishermen, while the others sink to the sea-bed or are trapped within surrounding coral and are thus killed and lost with little benefit to both the fishermen and the reef system (Ronquillo, 1961; Darwall, 1996). Secondly, although not targeted a single dynamite blast kills the majority of invertebrates within the immediate area and leads to a reduction in the abundance of demersal plankton, upon which many

reef fish feed (Porter and Porter, 1977; Walter *et al.*, 1981). Similarly, small juvenile fish, fish larvae and eggs, so important for later fish recruitment onto coral reefs, suffer the same fate (Munro *et al.*, 1987) while large areas of hard coral are destroyed usually leaving behind a large crater of coral rubble surrounded by a band of standing dead coral (Alcala and Gomez, 1987; Darwall *et al.*, 1996). It is this latter impact, the destruction of hard coral and the reef structure which has the greatest long term effect. A decrease in coral cover means less habitat and refuge space for fish to breed, rest and seek shelter from predators (Carpenter *et al.*, 1981; Darwall *et al.*, 1996). A reef that is continually blasted will therefore suffer a marked reduction in fish abundance and diversity (Luckhurst and Luckhurst, 1978; Thresher, 1983), with recovery very slow as the regeneration period of hard corals after a dynamite blast is minimal even after a period of 40 years (Alcala and Gomez, 1979).

Dynamite Fishing in Southern Tanzania

The Frontier Tanzania Marine Research Programme, a collaborative venture between the Faculty of Science, University of Dar es Salaam and the UK based Society for Environmental Exploration has conducted marine biological and resource use surveys using SCUBA and snorkelling techniques along the coast of southern Tanzania for the last seven years (Horrell and Ngoile, 1991; Darwall *et al.*, 1995, 1996; Guard, 1997). This work has included surveys on shallow water coral reefs (<20 m) and records of the number of dynamite blasts heard within the survey area over the study period. Apart from Mafia island, where the implementation of the Mafia Island Marine Park and recent dynamite patrols has led to a marked reduction in the use of explosives (Greg Andrews pers. comm.), results obtained for the rest of southern Tanzania reveal a sad picture both of the intensity of this practice and the extent of reef damage sustained (Darwall *et al.*, 1996; Guard, 1997; Hanaphy and Muller, 1997). Dynamite



The Tanzanian coastline

Fig. 1 Map of the Tanzanian coast.

fishing is illegal but is conducted in virtually all shallow water areas from the Songo-Songo archipelago down to the Mtwara district adjacent to the Mozambique border (Fig. 1). However, noticeable between Kilwa district and Lindi and Mtwara districts are differences in who is responsible for the dynamiting and how it is conducted.

The Kilwa Problem

In the Kilwa district the vast majority of blast fishing is practised by fishermen from Dar es Salaam and other

outside areas who travel to the region aboard 'ice boats' or motorized mashuas. These boats, as their name implies, contain a large insulated 1 t ice chest fixed to the deck. Ice is mainly obtained enroute from the ice plant based at Kilindoni, Mafia island. The boats are usually owned by a single business man or group in Dar es Salaam who supply the crew with dynamite. The crew consists of four to five young men one of whom, when fishing, stands on top of the ice chest in order to spot schools of pelagic fish or areas of high fish density which are then blasted with thrown dynamite after the short fuse is lit. After the blast two or more of the crew enter the water to collect the dead fish using small hand nets. The dead fish are then placed into the chests under a layer of chipped ice.

The dynamite fishermen who come to the region usually base themselves on smaller islands such as Nyuni, Okuza, Fanjove and Simaya within the Songo-Songo archipelago where the small villages have no police. In addition, most of the fishermen residing here are transient arriving from areas as far a field as Zanzibar and Mtwara. For the dynamite boats to stay at Songo-Songo island or in the Kilwa harbours is more difficult due to the more vociferous opposition against this practice found there (Masaiganah, 1995; Hanaphy and Muller, 1997). Each dynamite boat stays in the region for approximately two weeks after which the boats return to Dar to sell their catch of both dynamited fish and fish purchased from local fishermen. It is this last fact which complicates the situation. Although the vast majority of local fishermen voice their understanding of the negative effects of this practice and realize over the long term it will destroy their own fish stocks they say they are dependant on the sale of fresh fish to the ice boats to gain a daily income for their subsistence needs, the 'ice boats' being their only source of ready cash. In addition, although less tolerant of dynamiting than in the Lindi and Mtwara districts, villagers who have only small sailing vessels claim there is little they can do against the motorized mashuas. They are also not confident in the competence of some local police whom they say are corrupt and accept bribes (Masaiganah, 1995).

Local fishermen estimate that about 20-30 dynamite (ice boats) boats use explosives in the Kilwa district and report that over a 100 blasts were heard in a single day on Mpovi reef (M. Mkunga pers. comm.). Furthermore, the dynamiters responsible for this destruction were reportedly so confident that people feared them and that the police would do nothing, that they erected a flag on Mpovi reef which stated 'Hakuna Serikali katika Kilwa' or there is no government in Kilwa.

As a result of dynamite fishing all coral reefs throughout the Songo-Songo archipelago and adjacent to Kilwa Kivinje are extensively damaged above a depth of 10 m (Darwall *et al.*, 1996) For deeper reefs such as Pwajuu, Poasi, Jewe, Rukyira and Mwamba Makati, although extensively damaged in a band around the

upper levels, the lower reef slope (below 10 m) escapes more or less unscathed and is still covered in prolific coral growth providing shelter for many fish. However, for the more common shallower reefs such as Baniani, Msuagi, Mpovi and Amana the picture is very different with the vast majority of the reef destroyed. Large tracts of rubble are now the dominant feature on these reefs supporting few fish and showing few signs of regenerating (Darwall *et al.*, 1996; Hanaphy and Muller, 1997). Figures 2 and 3 show, respectively, a typical healthy reef and a typical blast affected reef.

The Lindi and Mtwara Problem

In contrast to the Kilwa situation in Lindi and Mtwara districts dynamite fishing is mainly practiced by youths (16–30 years) working in pairs from local villages using wooden canoes (mtumbwi). With the added difficulty of standing in a canoe and being much closer to the surface of the sea, spotting schools of fish is not as easy as from an ice boat. Instead one of the fishermen using a mask and snorkel locates areas of reef with a high density of fish after which the other

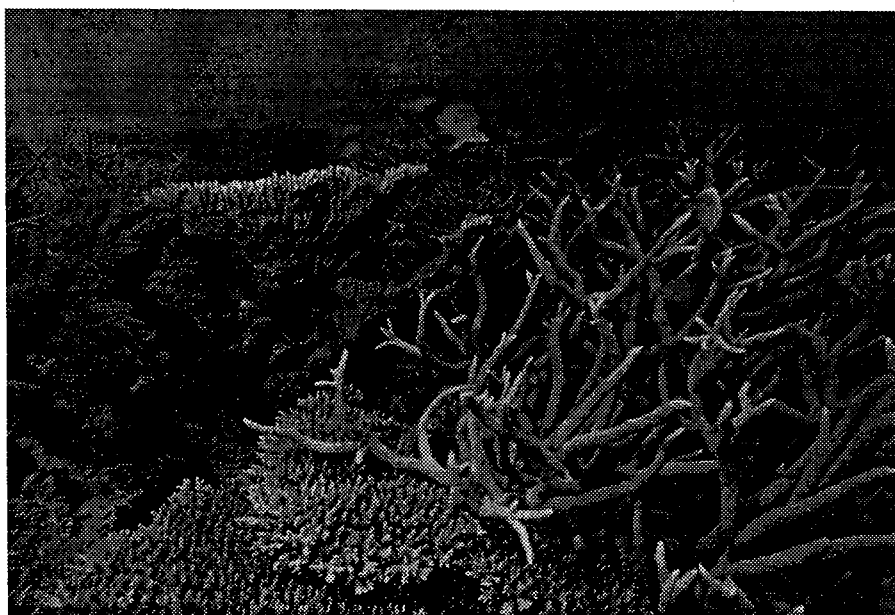


Fig. 2 Typical reef slope with healthy *Acropora* corals.



Fig. 3 Fragmented and killed corals after blast fishing.

fisherman throws the dynamite usually with the snorkeller still in the water holding onto the side of the canoe. The fish are then netted as before.

In the two districts, a recent drop in the cost of dynamite from Tsh 15 000 to as little as Tsh 400 a stick, has meant that blast fishing is now one of the most common methods practiced. As a result local youth now find little reason and motivation to accumulate the capital to purchase conventional fishing gear (Masaiganah, 1995). With this continuing, the basic practices of artisanal fishing in the region may be threatened with local skills and knowledge not being taught and passed down. This is further reinforced by the fact that as fish populations are depleted as a result of dynamite use, traditional fishing effort has to increase to maintain catch size. As traditional fishermen struggle to make an income they see their fellow dynamite fishermen making more money with relatively little effort, and as such the use of dynamite becomes a more attractive option especially as many believe there is no immediate solution to the problem. However, in reality this only perpetuates the problem.

The dynamite used in the Mtwara and Lindi regions is readily obtainable from known dealers along the coast who themselves obtain the explosives reportedly from road projects, quarry sites, mining enterprises and other sources. This is supported by the fact that 2–4 t of dynamite were reported missing from two road projects in the region in 1994 (Masaiganah, 1995). Fishermen report that dynamite can be purchased easily by anyone with the money, although sometimes it is offered on credit against such collateral as a bicycle. Another problem associated with this uncontrolled market is that many of the buyers are inexperienced and unfamiliar with the use and danger of dynamite resulting in a large number of accidents with loss of limbs and even death commonplace. These accidents are often attributed to shark attack.

Although, as in Kilwa, local communities are aware of the negative impacts that dynamite use has on their local marine resources (e.g. habitat destruction), apathy in dealing with the problem is widespread and is a consequence of local bitterness towards alleged corruption, and the leniency of sentences/punishment. This is highlighted by allegations from fishermen, during a workshop on marine issues (Sudi Workshop, 1994), that vessels using dynamite have been seized and turned in to the police by local people and fisheries officers, yet the police allowed the culprits to go free the same day with everything but the dynamite returned to them. Local people interpret such events as indicating that high government officials or police have a direct interest in the release of culprits and possibly the resale of the dynamite. Other such stories are abundant, whether true or not, the fact that local people believe in them goes a long way in explaining why there is widespread apathy and a lack of community action.

As is the case in Kilwa most of the shallower reef

areas in the Mtwara and Lindi districts are extensively damaged below depths of 10 m with more than 440 blasts recorded in Mnazi Bay, Mtwara over a 60 day period and a maximum of 26 blasts heard in 3 h.

Possible Solutions: What is Needed?

Obviously the use of dynamite can be linked to local poverty and the need for monetary income, but is this really a fair excuse? The income from blast fishing will only last as long as the fish stocks themselves which if continued will surely collapse in the very near future. Indeed, if this occurs the dealers and unknown boat owners who are the only people to acquire significant profits will simply seek out other lucrative enterprises.

To put an end to the problem requires not small token gestures such as occasional dynamite patrols but a complete rethink of the situation and the development of an effective strategy encompassing wide ranging action. This should include continuous patrolling and police enforcement (including a VHF radio network), improved legislation with increased fines, confiscation of vessels and jail sentences not only for users but those people found in possession of explosives. In addition, new stringent regulations are required in regards the use of dynamite in both regional and national road, mining and quarry projects. Those people in charge should be directly accountable for any missing dynamite with clear records kept on amounts used and its whereabouts. A marking system could be initiated whereby a stamp or particular symbol would run throughout the stick of dynamite or explosive indicating when and where the dynamite was made and what source it came from. Even more effective would be the gradual replacement of the dynamite with a type that does not work in a water medium.

However, in the long term probably the most important objective is to gain the full support of local communities through awareness, educational and capacity building programmes and through the development of initiatives for local communities such as local credit schemes for the purchase of conventional fishing gears and the training of local youths in boat building, net making and other possible alternative skills to enable income to be gained in a less destructive manner.

One such programme achieving positive steps towards effective community participatory management is the Marine Environment Protection Programme facilitated by the Rural Integrated Project Support Programme. This programme, by way of fostering community organization and empowerment through community workshops, slide shows, lectures, training and the provision of technical assistance aims to bring about the development of a community based management strategy for the three districts. The strategy will be formulated jointly by a regional conservation NGO 'The Confederation for the Protection of the Marine Environment' recently formed as a result of several

community workshops, local government and local fishermen. The programme also aims to establish a community operated monitoring scheme for each district both to assess the status of marine habitats and resource use over time but also to assess the success of management objectives and enable the formulation of new initiatives.

To help in this process data on dynamite fishing, the status of marine habitats, fish populations, turtles and local fisheries is now being collected from the Songo-Songo archipelago to the Mozambican border by Frontier Tanzania and will provide a baseline upon which local resource users can formulate management objectives in order to improve fisheries, protect important areas of biodiversity or juvenile fish nurseries and stop destructive or dangerous fishing practices. Dynamite patrols are also planned to be incorporated in the monitoring programme in the near future and it is hoped that with local public support dynamite fishing will be stopped in the region once and for all. Nevertheless, it must be realized for this to realistically happen all parties such as the police, local magistrates, local resource users and government at local, district, regional and national levels will have to support such a plan through collaborative committed action. Only then will this wasteful, destructive and blinkered practice be stopped.

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ERRATUM

Guard, M. and Masaiganah, M. (1997) Dynamite fishing in Southern Tanzania, geographical variation, intensity of use and possible solutions. *Marine Pollution Bulletin* 34, 758–762.

Due to an unforeseen error, Figs 2 and 3 in the above article appeared in black and white rather than colour. The figures are reproduced in colour below.



Fig. 2 Typical reef slope with healthy *Acropora* corals.



Fig. 3 Fragmented and killed corals after blast fishing.